B. F. CURTIS.

DOUBLE ACTING DUPLEX PUMP.

APPLICATION FILED SEPT. 3, 1920.

1,400,477.

Patented Dec. 13, 1921.

3 SHEETS—SHEET 1.

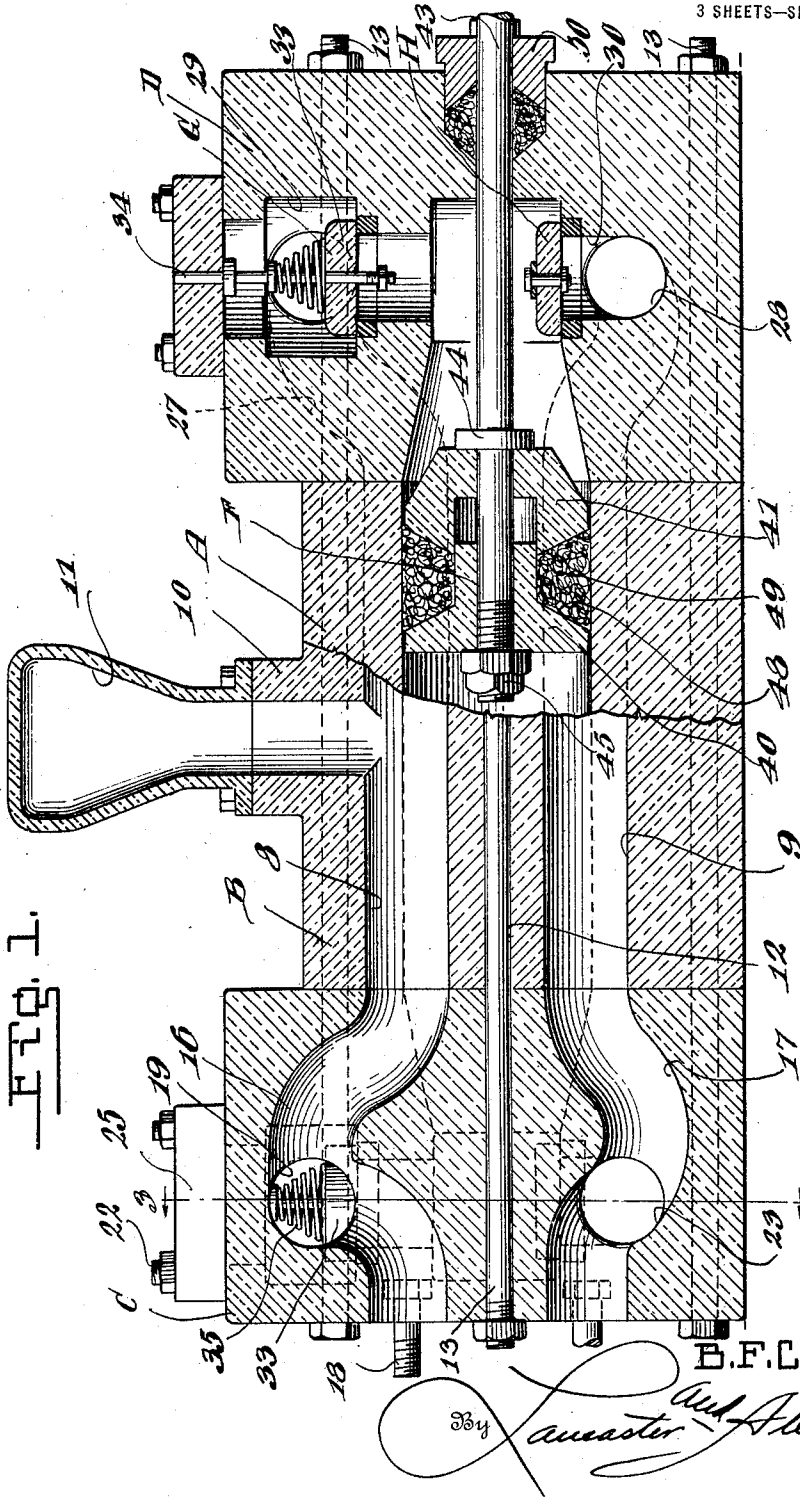


Fig. 1.

Inventor

B. F. Curtis

By Lancaster & Allwine

Attorneys

B. F. CURTIS.

DOUBLE ACTING DUPLEX PUMP.

APPLICATION FILED SEPT. 3, 1920.

1,400,477. Patented Dec. 13, 1921.

3 SHEETS—SHEET 2.

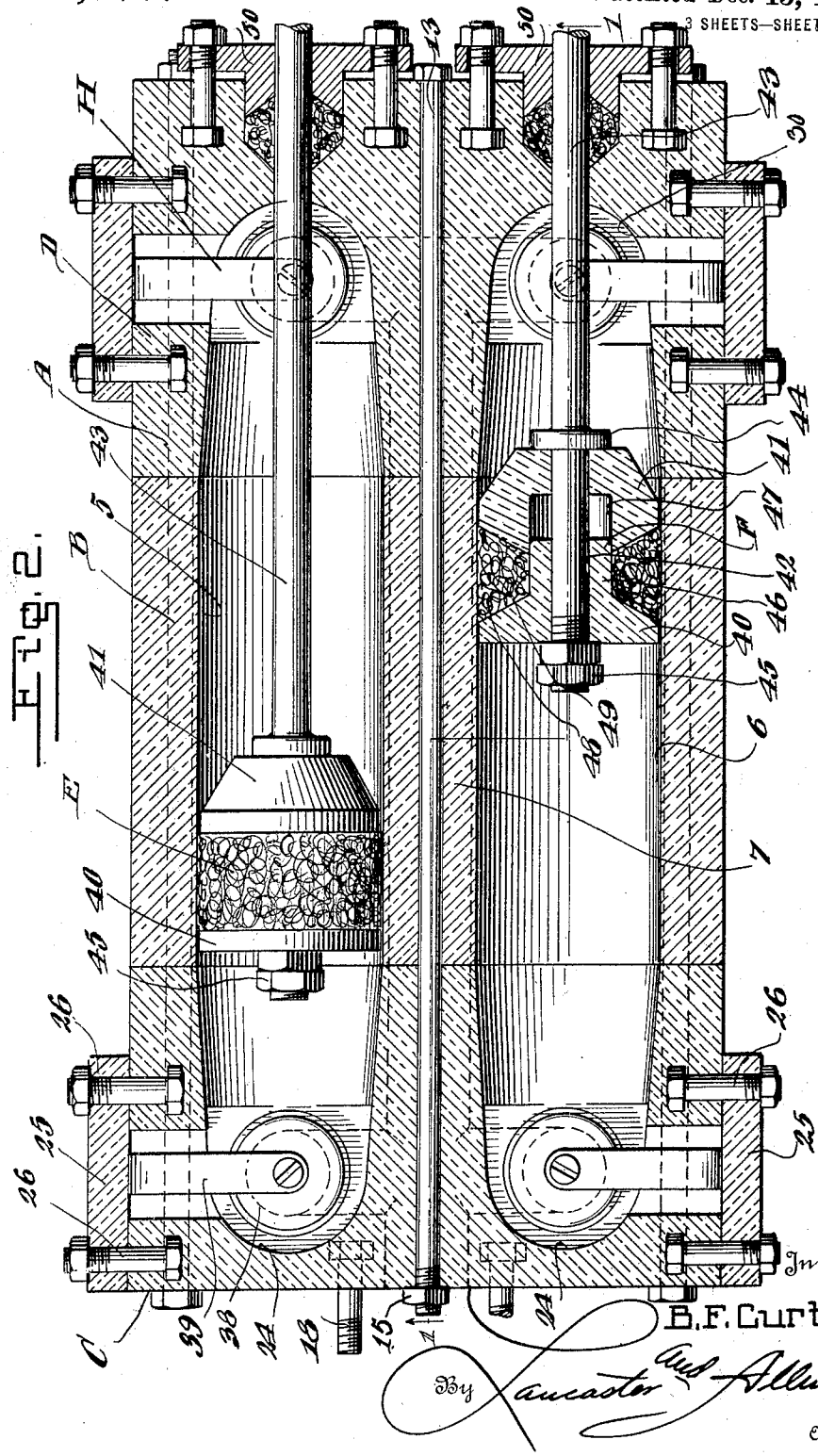



FIG. 2.

Inventor

B. F. Curtis

By Lancaster & Allwine

Attorneys

B. F. CURTIS.

DOUBLE ACTING DUPLEX PUMP.

APPLICATION FILED SEPT. 3, 1920.

1,400,477.

Patented Dec. 13, 1921.

3 SHEETS—SHEET 3.

Fig. 3.

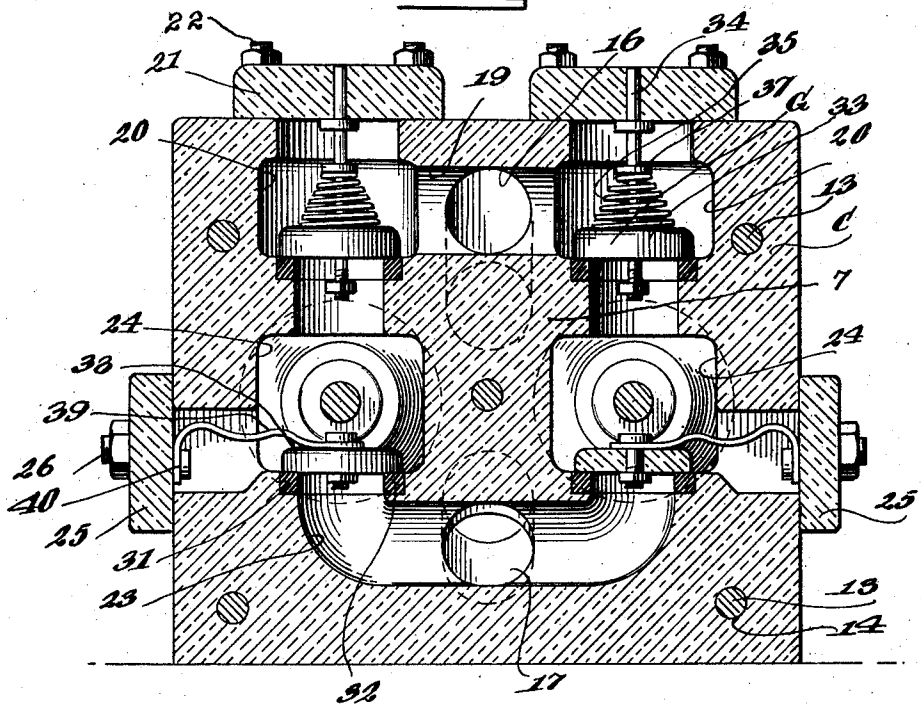
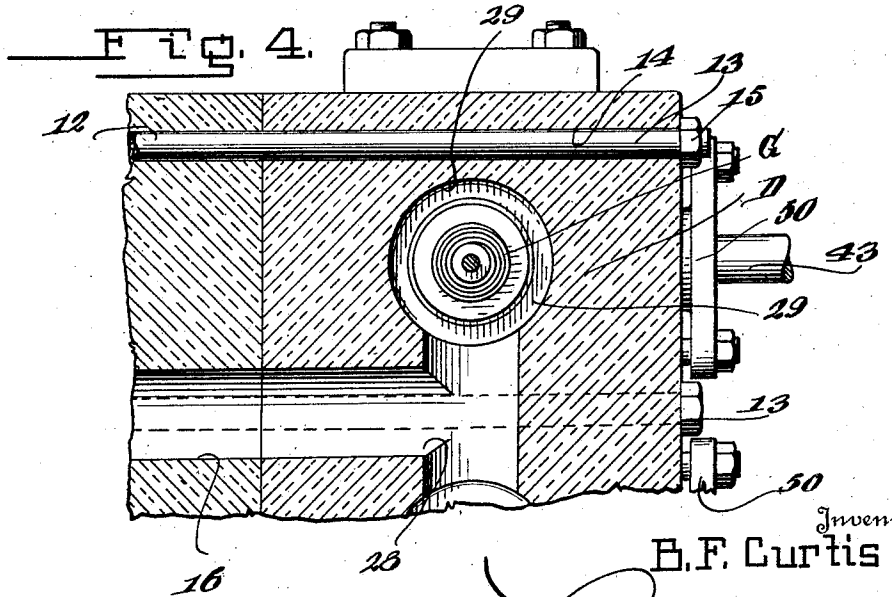



Fig. 4.




Inventor,

B. F. Curtis

By Lancaster and Allwine

Attorneys

# UNITED STATES PATENT OFFICE.

BENJAMIN F. CURTIS, OF POTEAU, OKLAHOMA.

## DOUBLE-ACTING DUPLEX PUMP.

1,400,477. Specification of Letters Patent. Patented Dec. 13, 1921.

Application filed September 3, 1920. Serial No. 407,947.

*To all whom it may concern:*

Be it known that I, BENJAMIN F. CURTIS, a citizen of the United States, residing at Poteau, in the county of Le Flore and State of Oklahoma, have invented certain new and useful Improvements in Double-Acting Duplex Pumps, of which the following is a specification.

This invention relates to pumps, and the primary object of the invention is to provide an improved pump especially designed for use in pumping fluids, which are liable to have a detrimental effect on the pump, such as fluids containing acids or the like. The life of pumps utilized in pumping water from mines or in parts of the country where acid in the water is prevalent, is generally short owing to the fact that the acid eats the metal from which the pumps are constructed. This not only entails the expense of repairing or buying new pumps, but also results in loss of time, while the new pumps are being installed, or while the old pumps are being repaired.

It is therefore a prime object of the invention to provide a pump constructed wholly of vitreous material, so that the same can withstand the chemical action of the acids.

Another prime object of the invention is to provide a pump embodying a minimum number of parts so arranged that access to the working portion of the pumps can be readily had, and to provide a pump having an improved arrangement of parts and ways so that an exceedingly simple and compact structure will be had.

A further prime object of the invention is to provide a pump constructed of vitreous material embodying a pair of cylinders molded *en bloc*, detachable heads for the block carrying the inlet and outlet valves which are arranged therewith in a novel manner, and an improved means for connecting the blocks and the heads together.

A still further object of the invention is to provide an improved pump of the above character, which will be durable and efficient in use, one that will be simple and easy to manufacture, and one which can be placed upon the market at a reasonable cost.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts as will be hereinafter more specifically described, claimed and illustrated in the accompanying drawings, forming a part of this specification, in which drawings:

Figure 1 is a central longitudinal section through the improved pump, taken on the line 1—1 of Fig. 2.

Fig. 2 is a central horizontal section through the improved pump.

Fig. 3 is a vertical transverse section through the pump illustrating the arrangement of the valves in the pump head, taken on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary horizontal section through the pump illustrating the arrangement of the outlet ports and ways therein.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter A indicates the improved pump which includes the cylinder block B; the heads C and D; the pistons E and F; the outlet or discharge valves G; and the inlet or suction valves H. The cylinder block B is formed wholly of vitreous material, such as glass, porcelain or the like, and may be molded or formed in any other preferred manner. The block B contains the horizontally alined bores 5 and 6, which have reciprocally mounted therein pistons E and F which will be hereinafter more specifically described.

The bores 5 and 6 are divided by the partition wall 7, which has arranged therein above and below the bores 5 and 6 the discharge way or bore 8 and the inlet way or bore 9. It can be seen that by arranging the inlet and discharge ways or ports, at the central portion of the block and in vertical alinement, only one main way or port is necessary for the discharge and inlet or suction valves.

A nipple 10 is formed on the cylinder block B at the central portion thereof and communicates with the discharge way or bore 8 and this nipple carries the air chamber 11, which is for the purpose of introducing an air cushion to counteract the solidity of the water, thus preventing shock as the water flows through the valves. A plurality of bores 12 having a relatively small diameter are also extended longitudinally through the block, for a purpose which will be hereinafter more fully described.

The heads C and D are also formed of

vitreous material, such as glass or porcelain, and are connected to the terminals of the cylinder block, by means of longitudinally extending bolts 13 which extend through the bores 12 and in alined bores 14 formed in the heads. The terminals of the bolts 13 have threaded thereon suitable retaining nuts 15. The head C is provided with an upper central discharge or outlet way or port 16 which alines with the discharge or outlet way or bore 8 in the cylinder block. The lower end of the head C is provided with a central inlet way or port 17, which alines with the inlet way or bore 9 formed in the block B. These ways or bores 16 and 17 curve upwardly and downwardly as clearly shown in Fig. 1 of the drawings, so as to facilitate the communication thereof with the outlet or discharge ports and the inlet or suction ports. The ways or ports 16 and 17 extend entirely through the head C as clearly shown and are adapted to have connected thereto the inlet and discharge pipes, (not shown), and suitable bolts 18 are anchored in the head C so as to facilitate the connection of the inlet and outlet pipes therewith. The way or bore 16 has communicating therewith the laterally projecting transverse ways 19, which communicate with the discharge or outlet ports 20. These ports 20 extend inwardly from the upper surface of the head C and are provided with cover plates 21, which are held in position by means of bolts 22 which are anchored in the head. These ports 20 extend above and directly at the terminals of the cylinder bores 5 and 6. The inlet way 17 also has communicating therewith the laterally extending transverse ways 23, which also communicate with the inlet ports 24, which are formed directly in rear of the cylinder bores 5 and 6. These ports 24 extend outwardly of the sides of the cylinder head B and are provided with cover plates 25 which are also held in place by means of bolts 26 which are anchored in the sides of the heads.

The head D is formed similar to the head C and is also provided with the central upper and lower discharge and inlet ways or bores 27 and 28, which communicate with the discharge or outlet ports 29 and the inlet or suction ports 30. The discharge or outlet ports 29 and the inlet ports 30 are formed in the head D exactly in the same manner as the ports 20 and 24 are formed in the head C and therefore description of the same is superfluous.

The discharge valves G and the inlet valves H are arranged in their respective ports and are also formed of vitreous material. Each one of these ports is provided with annular grooves 31, in which seat annular valve seats 32 which are preferably formed of rubber or the like.

Each of the discharge or outlet valves G includes a cylindrical valve body 33, which is slidably mounted on a depending valve stem 34, which is carried by the port covers 21. These valve bodies 33 are normally held on their seats by means of expansion springs 35 which are coiled around the valve stems, and these springs bear against the upper surface of the valve bodies 33 and against flanges or collars 37 formed on the valve stems. By this construction, it can be seen that when it is desired to repair a valve, it is merely necessary to remove one of the cover plates 21 and lift the valve off the seat through said ports.

The inlet valves also include the disk valve bodies 38 which fit upon the valve seats 32 and are adapted to be lifted off the same by the suction of the pistons. These valves are normally held on their seats by means of leaf springs 39, one end of which is secured directly to the valve and the other end to the covers 25 as at 40. When it is desired to move these valves, it is merely necesary to remove the cover plates and the valves will be lifted off their seats therewith.

From the arrangement of the valves in the cylinder heads C and D it will be seen that fluid will be pumped in each cylinder on each stroke of the pistons E and F, as it can be seen that there is an inlet and outlet port arranged at each end of each cylinder.

The pistons E and F are constructed identically the same and are also formed of vitreous material such as glass or porcelain. Each of the pistons includes the sections 40 and 41, which are provided with longitudinally extending bores 42 for the reception of the piston rods 43. The piston rods 43 are preferably formed from bronze or brass and are provided with annular flanges 44 which are adapted to engage the outer surface of the sections 41. The inner free ends of the piston rods 43 are threaded to a section of the lock adjusting nuts 45, which are adapted to engage the outer surface of the sections 40 and these nuts are adapted to force the sections toward each other. The sections 40 are provided with reduced cylindrical extensions 46, which are adapted to slidably fit within the enlarged portions 47 of the bores 42 formed in the sections 41. The inner faces of the sections are incilned as at 48, and a suitable packing 49 is interposed between the sections, and it can be seen that by adjusting the nuts 45, the packings can be forced into intimate engagement with the walls of the bores 5 and 6.

When it is desired to adjust the nuts 45 it is merely necessary to move the pistons to the ends of the cylinders and remove the cover plates 25, which will permit of insertion of a wrench or the like into a cylinder for engaging the nuts. The piston rods can then be rotated which will thread the nuts

toward or away from the sections 40 of the pistons according to the direction of rotation of the piston rods.

The pistons may be actuated in any preferred manner, and the method of actuating the same forms no part of this invention.

Suitable packing glands 50 are provided for the piston rods 43.

From the foregoing description, it can be seen that an exceptionally simple and durable pump has been formed, which is constructed wholly of vitreous material and which has a novel arrangement of ports and ways which permits of an exceedingly compact and simple structure to be had.

Changes in details may be made without departing from the spirit or scope of this invention; but,

I claim:

1. A pump comprising a vitreous body having a pair of longitudinally extending cylinder bores therein, vitreous heads fitted on the terminals of the body, longitudinally extending centrally disposed ways, formed in the block and heads intermediate the cylinder bores, the ways forming the inlet and discharge for the fluid, pistons reciprocably mounted in the bores, discharge and inlet ports formed in the heads at the terminals of the cylinder bores, laterally projecting ways connecting the ports with the longitudinally extending ways, and with the ports, the ports communicating with the sides and tops of the heads, detachable plates fitted over said ports, depending stems carried by the cover plates for the discharge ports, a slidably mounted valve arranged on each stem, spring means coiled around the stem engaging said valve, a leaf spring carried by the cover plates for the inlet ports, inlet valves carried by said leaf springs, and annular resilient valve seats arranged in said ports.

2. A pump comprising a body, a pair of heads detachably connected to the ends of the body, the body and heads having a pair of horizontally alined cylindrical bores formed therein, the bores terminating short of the outer ends of the heads, upper and lower vertically alined longitudinally extending ways formed in the body and heads intermediate the cylinder bores and opening out through one of the heads, a pair of inlet and outlet chambers arranged in each one of the heads communicating with the cylinder bores, transverse passage ways communicating with the upper and lower longitudinally extending ways and with the pairs of inlet and outlet chambers, discharge and inlet valves arranged in said chambers, and pistons reciprocably mounted in said cylinder bores.

BENJAMIN F. CURTIS.